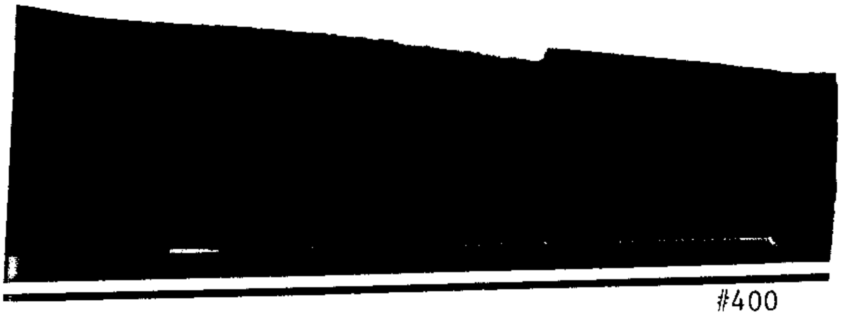

#400

ASTP-APOLLO

EUV DATA

75-066A-01A
75-066A-02A

ASTP-APOLLO

EUV DATA ON MAG TAPE

75-066A-01A

THIS DATA SET HAS BEEN RESTORED. ORIGINALLY IT CONTAINED ONE 9-TRACK, 1600 BPI TAPE WRITTEN IN BINARY. THERE IS ONE RESTORED TAPE. THE DR TAPE IS A 3480 CARTRIDGE AND THE DS TAPE IS 9-TRACK, 6250 BPI. THE ORIGINAL TAPE WAS CREATED ON AN IBM 360 COMPUTER AND WAS RESTORED ON THE MRS. THE DR AND DS NUMBER ALONG WITH THE CORRESPONDING D NUMBER AND TIME SPANS ARE AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN
DR005623	DS005623	D029597	13	07/16/75 - 07/24/75

ASTP-APOLLO

EUV DATA ON TAPE

75-066A-02A

This data set has been restored. There was originally one 9-track, 1600 BPI tape written in Binary. There is one restored tape. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The original tape was created on an IBM 360 computer and the restored tape was created on an IBM 9021 computer. The DR and DS numbers along with the corresponding D number are as follows:

DR#	DS#	D#	FILES	TIME SPAN
DR005907	DS005907	D029954	1 - 9	07/16/75 - 07/24/75

REQ. AGENT	RAND NO.	ACQ. AGENT
CMP	RC7833	RNH

ASTP-APOLLO

EUV DATA ON TAPE

75-066A-01A

75-066A-02A

This data set contains 2 tapes. They are Binary, 9-track, 1600 BPI, and were created on an IBM 360 computer. The format is on the following pages. The 'D' and 'C' numbers along with the time spans are as follows:

75-066A-01A

D#	C#	FILES	TIME SPAN
D-29597	C-19346	13	07/16/75 - 07/24/75

75-066A-02A

D-29954	C-19347	9	07/16/75 - 07/24/75

APOLLO-SOYUZ TEST PROJECT

SCIENCE EXPERIMENT

MA-083
(EUV TELESCOPE)

DOCUMENTATION FOR ARCHIVAL
SCIENCE DATA TAPES

Submitted by:

Jay Freeman
Space Astrophysics Group
Space Sciences Laboratory
University of California
Berkeley, California 94720

December 1976

Introduction

This documentation is submitted in partial fulfillment of contract NAS9-13799. The documentation describes the merged digital tapes of Apollo-Soyuz Test Project experiment MA-083 scientific data, which are furnished to NSSDC for archival purposes.

Quantity of Tapes: One

Physical Description:

The merged data tape is a standard 2400-foot reel of half-inch computer tape in a cannister. Data are written onto the tape at ~~1600~~ 6250 bits per inch, 9 tracks, odd parity.

Tape Labels:

A gummed label is affixed to the tape reel. The information on the label is as follows:

U. C. Berkeley MA-083 NAS9-13799
Tape 1 of 1
This tape contains 13 files
1600 bits/inch, 9 track, odd parity
First time 197:22:47; Last time 205:16:53

*The first and last times on the tape, to the nearest minute, are indicated in format DDD:HH:MM, in which DDD is the day of the year 1975, and HH:MM is the Greenwich Time on that day.

Tape Files:

Each separate file is the entire contents of an individual data tape furnished to U.C. Berkeley by NASA. Each file terminates with a file mark. On any given tape, all files are in the order of increasing time.

Time increases during each file, and from file to file, but inasmuch as experiment MA-083 was not operated continuously during the ASTP mission, there are many time discontinuities during the data.

A few parity errors have crept into the tapes at Berkeley since their receipt from NASA. These are duplicated on the archival tape.

File Format:

Each file contains a large number of physical records. The first and second physical record on each file are identical.* Each consists of 48 BCD characters (288 bits) of mission and experiment identification as follows:

APOLLObSOYUZbTESTbPROJ.bEXPbMA083bbbMMDDYYbRUNbX

In which:

MM/DD/YY = month/day/year of run
RUN X = run number for that day
b = blank

All other physical records contain 30 logical records, each of which contains 18 eight-bit bytes of information. Each such physical record thereby contains 540 bytes.

The format for each logical record is as follows:

BYTE NO.	CONTENTS
1,2	time (days)*
3,4	time (hours)*
5,6	time (seconds)*
7,8	time (milliseconds)*
9	flag bits (f_1 - f_8)**
10	all zeros
11	quality reference measurement #1
12	quality reference measurement #2
13	SL 9606 (DAC Register)

* These records may contain questionable data.

BYTE NO.	CONTENTS
14	SL 9607 (Current)
15	SL 9608 (Detector 1 counts)
16	SL 9609 (Detector 2 counts)
17	SL 9782 (Door Bit 1)
18	SL 9783 (Door Bit 2)

*Time quantities will be Fortran integer and will be right adjusted within each 16-bit field. Time used will be GMT of frames 1, 6, 11, . . . 46, 1, 6, 11, etc. All data quantities from frames 1-5 will be associated with time of frame 1, data quantities from frames 6-10 will be associated with time of frame 6, etc.

**f_1 will be the left-most bit (MSB) and f_8 will be the right-most (LSB) of byte 9. f_1 through f_8 of byte 9 are the flag bits for bytes 11 through 18 respectively.

Whenever a flag bit is on (equal to one), the data contained in the corresponding 8-bit byte is not valid and should not be used. That is, only those data quantities having a corresponding flag bit equal to zero should be used.

During times when MA-083 was on, logical records were obtained at 0.1-s intervals.

Summary Discription of Scientific Measurements:

Detailed interpretation and understanding of the scientific measurements (logical record bytes 13-18) requires other contract documents,* such as descriptions of instruments,* calibration tables,* etc. But in brief:

Byte 13, SL 9606, describes the position and state of motion of a six-element filter wheel in the optical path of MA-083.

* SEE LIST OF REFERENCES (FROM BERKELEY) FOR ADDITIONAL INFORMATION REQUIRED TO ANALYZE THIS DATA

Byte 14, SL 9607, describes a measurement of the current consumed by a portion of the MA-083 electronics.

Byte 15, SL 9608, describes the number of counts recorded by MA-083 detector #1 in the preceding 0.1s.

Byte 16, SL 9609, describes the number of counts recorded by MA-083 detector #2 in the preceding 0.1s.

Bytes 17 and 18, SL 9782 and SL 9783, describe the position of the door covering MA-083.

End of Volume:

After the last file on the tape, there are ten consecutive file marks.

APOLLO-SOYUZ TEST PROJECT

SCIENCE EXPERIMENT

MA-088
(HELIUM GLOW DETECTOR)

DOCUMENTATION FOR ARCHIVAL
SCIENCE DATA TAPES

Submitted by:

Jay Freeman
Space Sciences Laboratory
University of California
Berkeley, California 94720

May 1977

Introduction

This documentation is submitted in partial fulfillment of contract NAS9-13807. The documentation describes the merged digital tapes of Apollo-Soyuz Test Project experiment MA-088 scientific data, which are furnished to NSSDC for archival purposes.

Quantity of Tapes: One

Physical Description:

The merged data tape is a standard 2400-foot reel of half-inch computer tape in a cannister. Data are written onto the tape at 6250 ~~1600~~ bits per inch, 9 tracks, odd parity.

Tape Labels:

A gummed label is affixed to the tape reel. The information on the label is as follows:

U. C. Berkeley MA-088 NAS9-13807
Tape 1 of 1
This tape contains 9 files
1600 bits/inch, 9 track, odd parity

Tape Files:

Each separate file is the entire contents of an individual data tape furnished to U. C. Berkeley by NASA. Each file terminates with a file mark. On any given tape, all files are in the order of increasing time.

Time increases during each file, and from file to file, but inasmuch as experiment MA-088 was not operated continuously during the ASTP mission, there are many time discontinuities during the data.

A few parity errors have crept into the tapes at Berkeley since their receipt from NASA. These are duplicated on the archival tape.

File Format:

Each file contains a large number of physical records. The first and second physical record on each file are identical. Each consists of 48 BCD characters (288 bits) of mission and experiment identification as follows:

APOLLObSOYUZbTESTbPROJ.bEXPbMA088bbbMMDDYYbRUNbX

In which:

MM/DD/YY = month/day/year of run
RUN X = run number for that day
b = blank

All other physical records contain 30 logical records, each of which contains 24 eight-bit bytes of information. Each such physical record thereby contains 720 bytes.

The format for each logical record is as follows:

BYTE NO.	CONTENTS
1,2	time (days)*
3,4	time (hours)*
5,6	time (seconds)*
7,8	time (milliseconds)*
9	flag bits (f_1 - f_8)**
10	flag bits (f_1 - f_8)**
11	quality reference measurement #1
12	quality reference measurement #2
13	SL 9610 (He tank pressure)
14	SL 9611 (He temp.)
15	SL 9612 (#1 pressure)

BYTE NO.	CONTENTS
16	SL 9613 (Current)
17	SL 9614 (#2 pressure)
18	SL 9615 (Det 1 Count Rate)
19	SL 9616 (Det 2 Count Rate)
20	SL 9617 (Det 3 Count Rate)
21	SL 9618 (Det 4 Count Rate)
22	SL 9784 (Door Bit 1)
23	SL 9785 (Door Bit 2)
24	Unused

* Time quantities will be Fortran integer and will be right adjusted within each 16-bit field. Time used will be GMT of frames 1, 6, 11, ... 46, 1, 6, 11, etc. All data quantities from frames 1-5 will be associated with time of frame 1, data quantities from frames 6-10 will be associated with time of frame 6, etc.

** f_1 will be the left-most bit (MSB) and f_8 will be the right-most (LSB) of byte 9. f_1 through f_8 of byte 9 are the flag bits for bytes 11 through 18 respectively. f_1 through f_3 of byte 10 are not used. f_4 through f_8 are flag bits for bytes 19 through 23 respectively.

Whenever a flag bit is on (equal to one), the data contained in the corresponding 8-bit byte is not valid and should not be used. That is, only those data quantities having a corresponding flag bit equal to zero should be used.

During times when MA-088 was on, logical records were obtained at 0.1-s intervals.

End of Volume:

After the last file on the tape, there are ten consecutive file marks.

75-066A-01A

APOLLO-SOYUZ ASTP
EUV TELESCOPE MA-083

UNIVERSITY OF CALIFORNIA, BERKELEY

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SPACE SCIENCES LABORATORY
BERKELEY, CALIFORNIA 94720

May 14, 1982

Ms. Maureen Locke
National Space Science Data Center
Goddard Space Flight Center
Code 601
Greenbelt, MD 20771

Ref: RFM/EUVE/125/82

Dear Maureen:

All apologies for the delay. The relevant documents for use of the EUV would be:

1) Bowyer, S. Margon, B., Lampton, M., Paresce, F., and Stern, R., 1977 Apollo Soyuz Test Project Summary Science Report, NASA SP-412, Vol. 1, pp. 49-70.

2) The enclosed document, of unknown publication location.

3) Lampton, et al. 1976, Ap. J., 203, L71.

4) Margon, et al. 1976, Ap. J., 210, L79.

5) Greenstein, et al. 1977, Astron. Astroph. 54, 623.

6) Cash, et al. 1978, Ap. J., 219, 585.

7) Margon, et al. 1978, Ap. J. 224, 167.

8) Ayres, et al. 1978, Astron. Astroph. 70, 431.

9) Stern, et al. 1979, Ap. J., 230, 755.

10) Crawford, et al. 1979, Astron. Astroph. Suppl. 36, 371.

These documents contain the instrument description that would be needed.

Sincerely, and all the best with all us un-cooperatives!

Roger

Roger F. Malina
Space Astrophysics Group

RFM:jg

Encl:

4. EXTREME ULTRAVIOLET SURVEY

EXPERIMENT MA-083

S. Bowyer,[a†] B. Margon,[a] M. Lampton,[a] F. Paresce,[a] and R. Stern[a]

ABSTRACT

A grazing incidence telescope sensitive to radiation in the 5- to 100-nanometer (50 to 1000 angstrom) band was flown in the Apollo service module. On 10 nighttime revolutions, the command and service module was maneuvered to point the instrument at 30 different stellar targets for periods of 1 to 20 minutes, thus constituting the first sensitive search for extreme ultraviolet radiation from nonsolar sources. Several hours of supplementary data were also obtained during nighttime orbits when other experiments in the scientific instrument module bay were operating.

Preliminary analysis of a small fraction of the total data indicates the definite detection of a strong source of extreme ultraviolet radiation during observations made during revolution 109. The source is located in Coma Berenices at $\alpha = 13^h13^m$, $\delta = +29°$. Positive detections have been made in the 17- to 62-, 11.4- to 15-, and 5.5- to 15-nanometer (170 to 620, 114 to 150, and 55 to 150 angstrom) wavelength bands. The intensity is 4 pW/m^2 (4×10^{-9} ergs/cm^{2}sec) in the 17- to 62-nanometer (170 to 620 angstrom) band. The suggested optical identification is the white dwarf HZ 43. If this association is correct, the star has the highest temperature of any known white dwarf. Regardless of the optical identification, however, this object is the first nonsolar source to be detected in the extreme ultraviolet band.

INTRODUCTION

Astronomical observations of nonsolar sources in the extreme ultraviolet (EUV) region of the electromagnetic spectrum (10 to 100 nanometers (100 to 1000 angstroms)) are of profound significance for studies of stellar evolution, stellar atmospheres, and the interstellar medium. The existence of stars producing predominantly ionizing radiation (wavelengths less than 91.2 nanometers (912 angstroms)) has been postulated to explain the ionization state of the interstellar medium. Such stars might represent a very hot phase of stellar evolution (refs. 4-1 and 4-2). Effective surface temperatures greater than 20 000 K have been observed, for example, among O stars, among white dwarfs of classes DAn and DAwk, among the subdwarf OB stars (ref. 4-3), and among the ultraviolet (UV) excess objects observed from the European TD-1A satellite (ref. 4-4). A major deterrent to previous attempts at celestial

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[a]University of California at Berkeley.

[†]Principal Investigator.

EUV observations has been the opacity of the interstellar gas resulting from photoelectric absorption by neutral hydrogen and neutral and singly ionized helium. However, recent spectroscopic studies of interstellar matter toward nearby stars (refs. 4-5 to 4-7) indicate that in many directions neutral hydrogen concentrations are as low as 0.01 to 0.1 atom/cm^3. Then, the absorption cross sections given in reference 4-8 indicate that direct EUV observations of sufficiently hot stars should be possible to distances of 20 to 100 parsecs.

Preliminary surveys at EUV wavelengths have been made from sounding rockets and have set upper limits of approximately 10^{-10} W/m^2 (10^{-7} ergs/cm^{2}sec) for sources in limited regions of the sky (refs. 4-9 to 4-11). However, significant constraints on stellar emission models would require improvements in sensitivity of perhaps two orders of magnitude. The Apollo-Soyuz mission offered the opportunity to make extended observations of numerous candidate stars with an EUV telescope that had the requisite sensitivity. Ten nighttime orbits were used to obtain data on 30 preselected stars, 1 planet, and the EUV background radiation. A preliminary analysis of quick-look data has indicated that one target exhibited a particularly intense EUV flux. A second target was also detected at a statistically significant level above the background. Computer processing of the production data will make weaker flux level targets also detectable.

EQUIPMENT

The EUV telescope (ref. 4-12) consisted of a 37-centimeter-diameter grazing incidence mirror assembly, a continually rotating (10 rpm) six-position filter wheel, and a pair of channel electron multiplier detectors. A schematic view of the instrument is shown in figure 4-1.

The parabolic optics were fabricated from aluminum coated with a nickel alloy and then overcoated with a fine layer of gold. The filter wheel included an opaque filter that permitted nearly continuous monitoring of the detector background during the mission. The field of view of the instrument was circular with selectable diameters of 2.5° or 4.3° full width at half maximum obtained by commanding either detector into the focal position. The detailed construction of the detector modules is described in reference 4-13. The detector not at the focal position was also monitored to establish further the stability of the background count rates. Count rates from both detectors were telemetered each 0.1 second together with the filter wheel position and other auxiliary information.

The entire system was calibrated in the laboratory with collimated radiation at numerous wavelengths between 4.4 and 265 nanometers (44 and 2650 angstroms). Absolute intensities were established by using National Bureau of Standards-calibrated vacuum-photodiode secondary standards above 20 nanometers (200 angstroms) and propane proportional counters below 20 nanometers (200 angstroms). The various filters, in combination with the efficiency characteristics of the mirror assembly and detector, defined the wavelength bands illustrated in figure 4-2. The detailed response of the system is summarized in table 4-I. The filters and their bandpasses at 10 percent of peak transmission, the energy-integrated effective area, or grasp $G = \int A(E)dE$, and the effective energy $E_e = \frac{\int EA(E)dE}{G}$ are given in table 4-I.

The experiment was mounted to a shelf in bay 1 of the service module (SM). A protective cover enclosed the instrument assembly at all times when the experiment was not in operation. At appropriate times in the Flight Plan, the crew activated a switch in the command module (CM) to open the cover. The remaining experiment controls consisted of a POWER ON/OFF switch and a two-position detector-selection switch. Both switches were located in the CM and operated by the crew.

The observing procedure consisted of opening the experiment cover, waiting 10 seconds to permit the ambient pressure in the SM bay to vent to vacuum, and then turning the instrument power on. The crewmember then selected the appropriate detector to ensure that the proper channel multiplier was always in the focal plane. The filter wheel operated automatically and continuously whenever the instrument power was on.

The telescope was oriented at preselected targets by using the spacecraft command module computer (CMC) for guidance and orientation and by using the normal Apollo reaction control system thrusters for maneuverability to point the instrument line of sight at the desired position on the celestial sphere for predetermined lengths of time. The typical target observation sequence consisted of spending equal amounts of time pointing at a target and at two background points located 3° on each side of the target. Any statistically significant differences between the average count rates when observing target and background are then attributable to EUV emission from the object under study. Target observations lasting from 1 to 20 minutes were executed.

RESULTS[1]

The EUV telescope functioned perfectly during the entire mission. The background count rates remained low and reproducible, and analysis of quick-look data shows no evidence of degradation in instrument sensitivity from the laboratory-measured values.

On revolution 65 at 108 hours 26 minutes ground elapsed time, a preplanned raster scan maneuver was executed using a special erasable memory program in the CMC. This maneuver consisted of slewing the telescope in a zigzag pattern back and forth across a star of known brightness in the far UV (~130 nanometers (~1300 angstroms)) where the barium fluoride filter has maximum sensitivity. Because the target position is known in celestial coordinates, a comparison of the time history of the barium fluoride count rates during this maneuver with the known command and service module (CSM) attitude enables the calculation of the actual (in-flight) alinement of the experiment with respect to the CM inertial measuring unit. This information could then be used to recompute CSM pointing data for mission targets to

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[1]Also see section 1.

compensate for any changes in alinement from the nominal values caused by vibration or thermal stresses. However, analysis of the revolution 65 raster scan data, obtained on the stars ι Aql and κ Aql, indicated, to an accuracy of 0.3°, that no change from the nominal alinement occurred.

Observation of the targets proceeded normally with occasional small deviations from the observing list caused by time-line anomalies. The rationale for target selection is discussed in reference 4-12. A list of the targets actually observed appears in table 4-II. This list is composed of 30 distinct targets. Seven targets were observed twice during the mission, one target was observed three times, and one target was observed during an extended crew sleep period while the spacecraft was in a fixed inertial attitude. During the mission, considerable real-time planning enabled additional high-quality science data to be obtained. For example, on day 4 of the mission, the American Association of Variable Star Observers advised that the dwarf nova SS Cygni had undergone an optical outburst. As a result, additional observations of this target were obtained on revolutions 80 and 105.

The most interesting target data examined thus far were obtained on revolution 109. As part of the observing schedule, the ultrasoft X-ray source in Coma Berenices (refs. 4-14 to 4-16) was observed for 7 minutes starting July 22, 1975, at 22:26 GMT. After taking background data for 1 minute, a 3° spacecraft roll maneuver brought the center of the instrument line of sight to a point 1° north of the intended target. Thus, the target was just at the edge of the 2° field of view of the instrument. Several roll and pitch motions of approximately 0.5° resulted from spacecraft motion within the attitude dead-band box and moved the field of view off and on the source. Finally, additional sky background data were obtained 3° off the target.

During these maneuvers, obvious increases and decreases in the detector count rates were immediately recognized. A plot of the count rate as opposed to time is shown in figure 4-3 for the 5.5- to 15-, 11.4- to 15-, 17- to 62-, 50- to 78-, and 135- to 154-nanometer (55 to 150, 114 to 150, 170 to 620, 500 to 780, and 1350 to 1540 angstrom) bands with each point representing the average count rate during an 0.8-second time interval. Also shown is the count rate in the opaque filter position, which indicates that the observed instrumental background remained steady at 0.6 count/sec.

A crude estimate of the spectral energy distribution of an object can be made by dividing the observed count rate in each band by the appropriate energy-integrated effective area. Such an estimate is exact for continua having constant photon fluxes per unit frequency. Listed in table 4-I are the observed background-subtracted count rates for the Coma source and the estimated continuum fluxes, both raw and corrected for atmospheric attenuation at E_e based on the Committee on Space Research International Reference Atmosphere 1965 model 2 reference atmosphere, appropriate for the observing conditions. The total energy flux in the 17- to 62-nanometer (170 to 620 angstrom) band is approximately 4 pW/m^2 (4×10^{-9} $ergs/cm^2$ sec).

These intensities have been plotted as a function of wavelength in figure 4-4. Also shown is the 4.4- to 16.5-nanometer (44 to 165 angstrom) detection and 1 kiloelectronvolt upper limit reported in reference 4-16. The data appear compatible and support the identification of the EUV object with the Coma soft X-ray source. This figure clearly indicates that the spectrum peaks in the EUV band at approximately 30 nanometers (300 angstroms).

A more precise description of the spectrum can be provided by using the observed count rates to constrain parameters of emission models. The simple continuum models chosen for these calculations had photon number per unit energy functions of the following forms: power law, $N(E) = AE^n \exp(-N_H\sigma)$; exponential, $N(E) = AE^{-1} \exp(\frac{-E}{kT}) \exp(-N_H\sigma)$; and blackbody, $N(E) = AE^2[\exp(\frac{E}{kT})-1]^{-1} \exp(-N_H\sigma)$. In each case, the energy-dependent attenuation cross section per hydrogen atom σ has been taken from reference 4-8 with normal abundances, no ionization, and no molecular hydrogen.

The collected data can be satisfactorily fit by any of these trial spectra provided that the free parameters are appropriately chosen. Figure 4-5 shows the derived parameter constraints for these models. In each case, contours are drawn at the $\chi^2_{min} + 6.25$ level appropriate for 90 percent statistical confidence with three free parameters (ref. 4-17). These constraints are compatible with, but much stricter than, the parameter regions derived from the soft X-ray rocket data given in reference 4-16.

Positional information on this source can be derived from the fact that, as the spacecraft pointing varies, the count rates are occasionally interrupted. Telemetered data on the CSM aspect have been combined with in-flight data on the experiment alinement to obtain four independent position zones for the source. These zones define a common region that is shown in figure 4-6 superposed on the relevant star field.

The Small Astronomy Satellite-3 observations reported in reference 4-15 have given a positional error box for the soft X-ray source that is compatible with the EUV position and is also shown in figure 4-6. It is highly probable that one object is responsible for the soft X-ray and EUV emissions. It has been suggested (ref. 4-15) that the soft X-ray object is the hot white dwarf HZ 43 at $\alpha(1950) = 13^h14.0^m$, $\delta(1950) = +29°22'$. This object is also marked on figure 4-6, and the EUV position is compatible with this suggestion.

If this identification is correct, it is of interest to determine whether any of the simple EUV spectra in figure 4-5 are compatible with the optical brightness of the star HZ 43. Magnitudes for HZ 43 have been published in reference 4-18 and are given as V = 12.86, B = 12.76, and U = 11.62 where V, B, and U are brightnesses in the standard astronomical photoelectric system. The power law and exponential spectra, if extended to visible wavelengths, would give magnitudes much redder and brighter than observed. However, the blackbody spectra would be compatible at $\simeq$110 000 K. If this simple model is correct, the stellar radius is 7800 D_{100} kilometers, where D_{100} is the distance to the star in units of 100 parsecs, and the corresponding luminosity is 17 D_{100}^2 $L_\odot$, where $L_\odot$ is the solar luminosity,

3.83×10^{33} ergs/sec. These parameters are in reasonable agreement with white dwarf models. Although these data do not uniquely require a blackbody stellar spectrum, with this explanation and identification, HZ 43 has the highest temperature of any known white dwarf.

Additional observations obtained on revolution 109 indicate the probable detection of EUV radiation from an additional target. Although detailed aspect data are still being reduced, it appears that the source may be the M-dwarf star Proxima Centauri. Detections appear in the 5.5- to 15-nanometer (55 to 150 angstrom) band and possibly the 11.4- to 15-nanometer (114 to 150 angstrom) band. Both detections are at an intensity substantially less than the Coma source.

Data from targeted observations on revolutions other than 109 have not been processed but will have sensitivity similar to that described previously. In addition, a substantial volume (several hours) of supplementary data was obtained by the EUV telescope while it was being used with the Helium Glow Detector or the Soft X-ray Experiments. These data will be processed to search for discrete sources of EUV radiation and to derive information on the spectrum, intensity, and isotropy of the ultrasoft X-ray/EUV cosmic diffuse background radiation. The data are the most extensive ever obtained on the latter problem.

SUMMARY

All the primary goals of the EUV Survey Experiment were achieved. Data were obtained on 30 different targets belonging to a variety of different classes of stars. Extensive and sensitive data on the EUV background radiation were also acquired. Preliminary analysis of the data indicates the detection of at least one strong source of EUV radiation, which is the first nonsolar source to be detected in the EUV band and proves the feasibility and value of astronomical observations at the wavelengths indicated in this report.

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TABLE 4-I.- EUV PHOTOMETRIC DATA

Instrument characteristics					Data	Derived fluxes		
Filter material	Bandpass		Grasp, cm^2eV	Effective energy,	Coma source observation count rate,[a] counts/sec	Uncorrected, ph $(cm^2 sec\ eV)^{-1}$	Corrected for atmosphere	
	eV	nm (A)					ph $(cm^2 sec\ eV)^{-1}$	mfu[b]
Parylene N	83 to 225	5.5 to 15.0 (55 to 150)	590	142	22 ± 1	0.037	.039	3.7
Beryllium	83 to 109	11.4 to 15.0 (114 to 150)	60	100	8 ± 0.5	.13	.15	9.9
Aluminum plus carbon	20 to 73	17 to 62 (170 to 620)	270	46	160 ± 3	.59	1.0	30
Tin	16 to 25	50 to 78 (500 to 780)	108	21	<50	<.46	<1.2	<17
Barium fluoride	8.0 to 9.2	135 to 154 (1350 to 1540)	0.47	9	<25	<53	<53	<325

[a]Errors quoted are ±1σ.

[b]mfu = 10^{-26} ergs/cm^{2}sec Hz.

TABLE 4-II.- TARGETS OBSERVED BY THE ASTP EUV TELESCOPE

Revolution	Target
72	EV Lac, AE Aqr, NGC 7293, ε Eri
73	VW Cep, DQ Her, 70 Oph, α PsA
80	EV Lac, SS Cyg, DQ Her, θ Oph, α Cen
88	α CMa B
89	NGC 6853, PSR 1929, α Aql, UV Cet, Feige 24
90	SS Cyg, 61 Cyg, BD +24° 4811, Jupiter
94	HZ 29, i Boo, Prox Cen
105	SS Cyg, BD +24° 4811
108	Wolf 424, α Cen, Z Cha, VW Hyi, UV Cet
109	CP 1133, HZ 43, Prox Cen, PSR 1451, β Hyi
113 to 117	Wolf 424

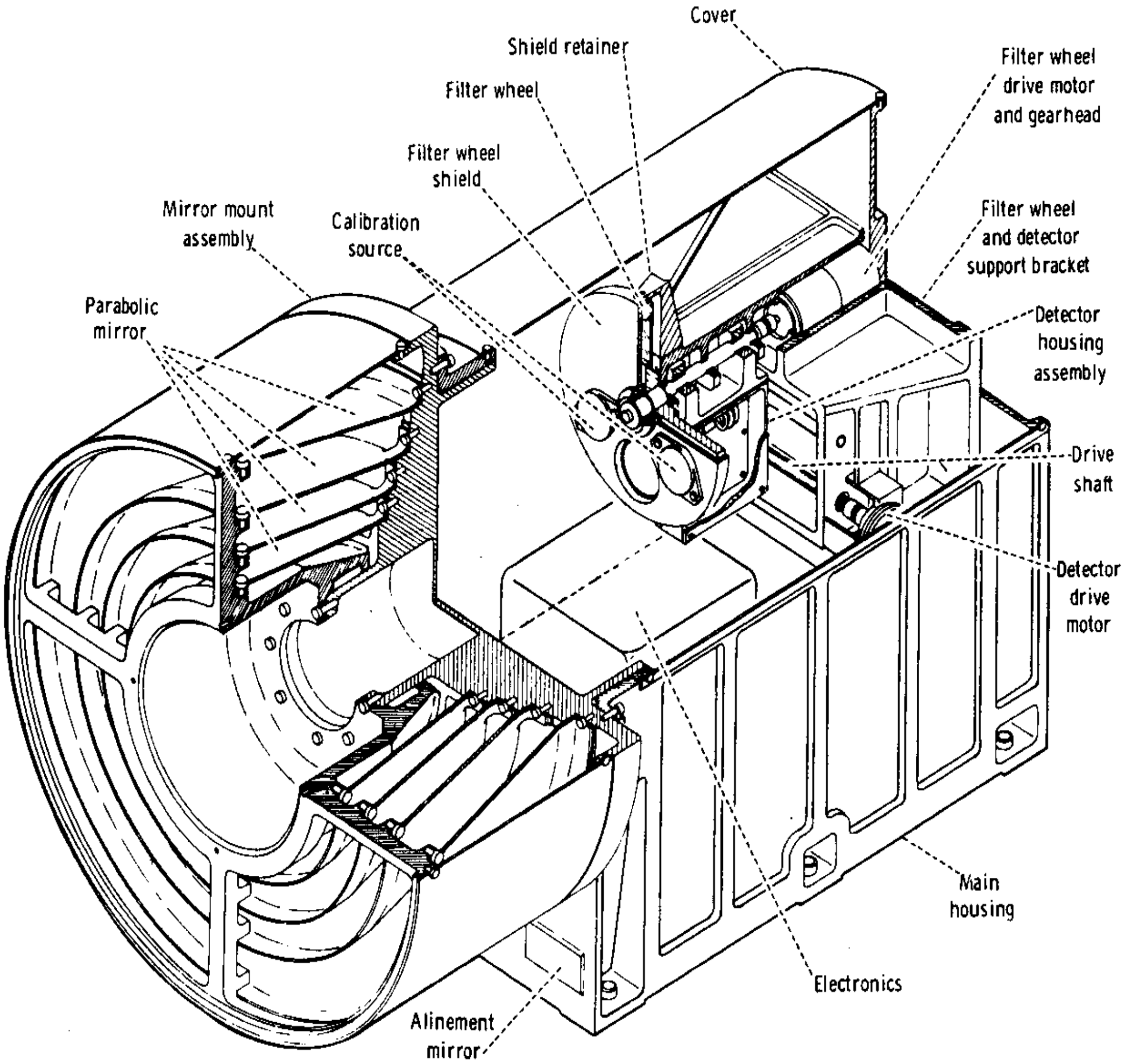


Figure 4-1.- A schematic diagram of the EUV telescope.

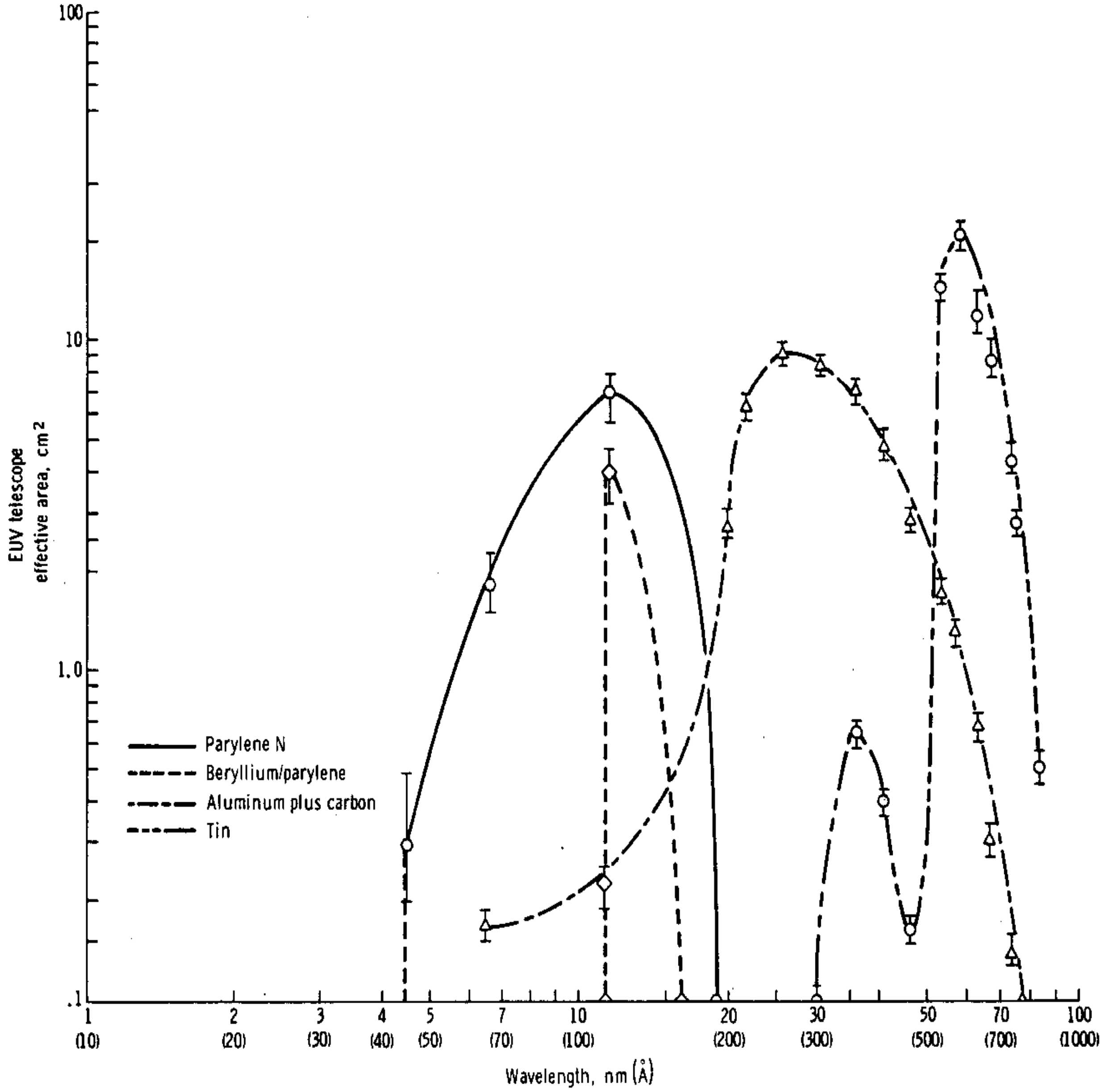
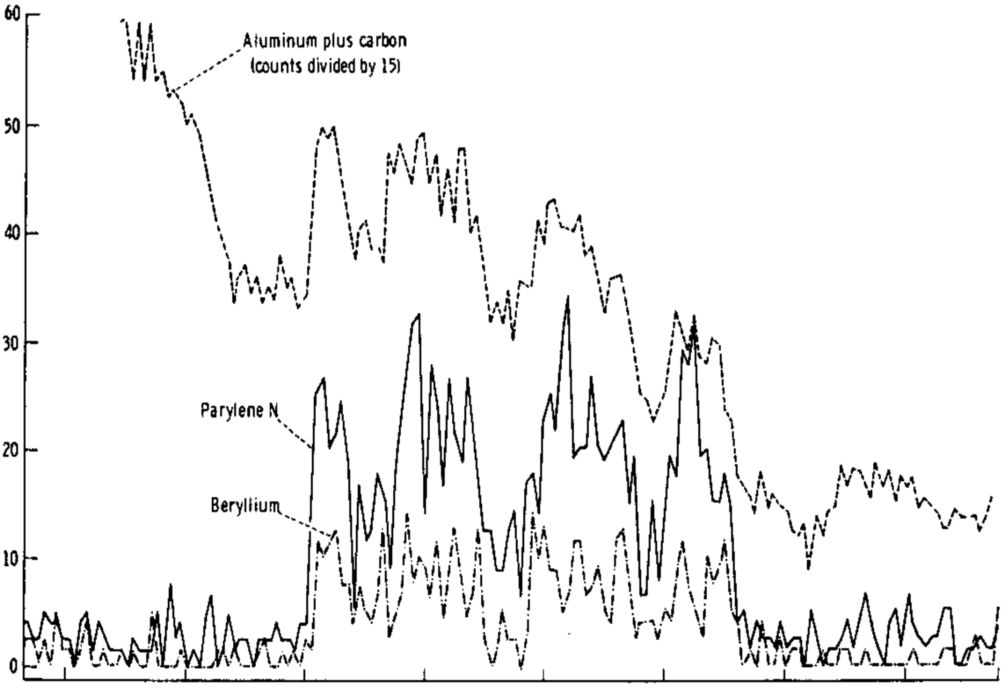
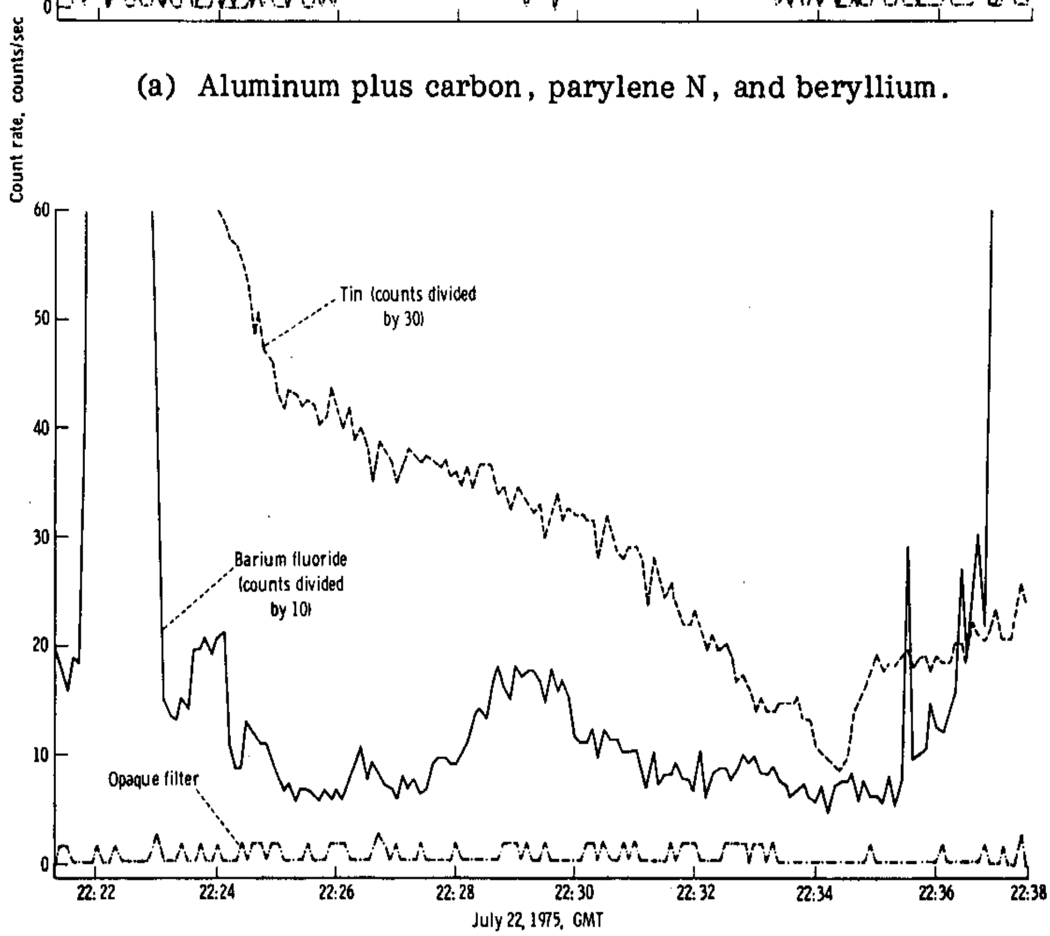


Figure 4-2.- Effective area of the EUV telescope as determined by laboratory calibration data. (The response of the barium fluoride bandpass, which was used primarily for instrument alinement determination, is given in table 4-I.)



(a) Aluminum plus carbon, parylene N, and beryllium.



(b) Tin, barium fluoride, and the opaque filter.

Figure 4-3.- The EUV data obtained during a portion of revolution 109. The trends in the aluminum and tin band passes are due to the spatial variations in the geocoronal foreground radiation. This behavior was repeated on numerous orbits. The barium fluoride count rates are dominated by the occasional observations of known blue stars.

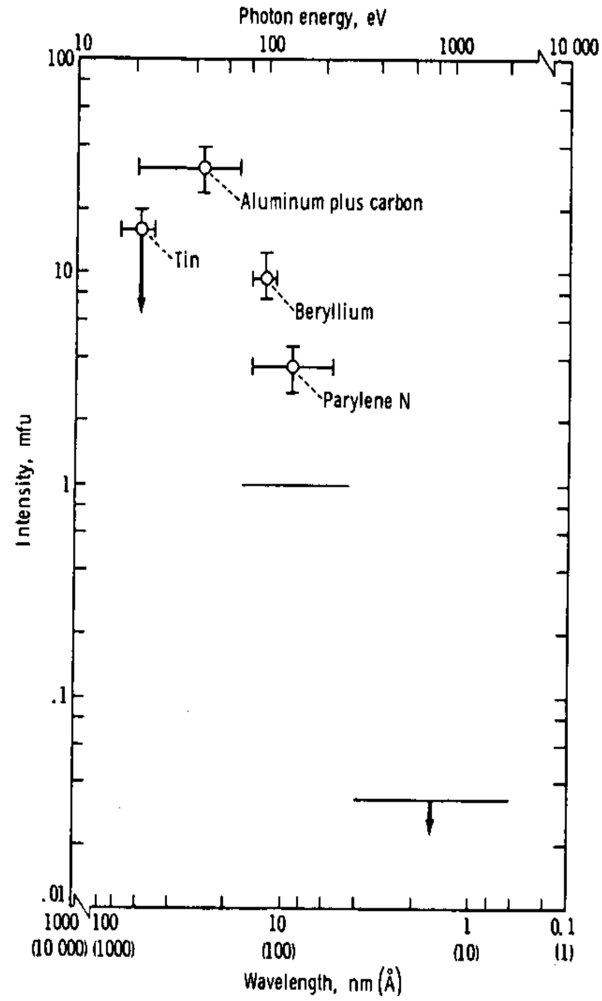
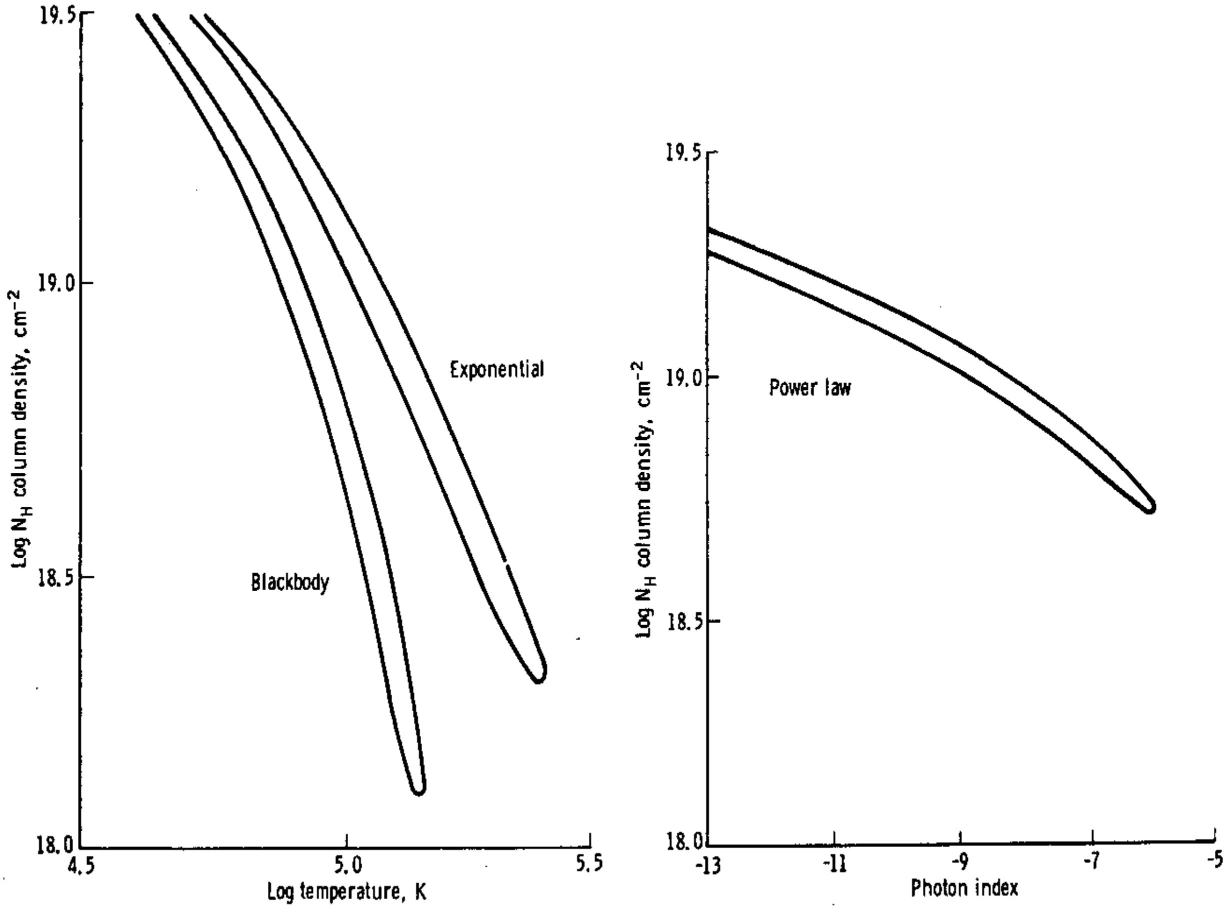


Figure 4-4.- Spectral intensities derived from the EUV data on the source in Coma Berenices. Soft X-ray data (ref. 4-16) are also shown.



(a) Blackbody and exponential contours.

(b) Power law spectra contour.

Figure 4-5.- Contours of constant χ^2 for the fits of blackbody, exponential, and power law spectra. Each contour has been drawn at the $\chi^2_{min} + 6.25$ level appropriate for 90 percent statistical confidence with three adjustable parameters (ref. 4-17).

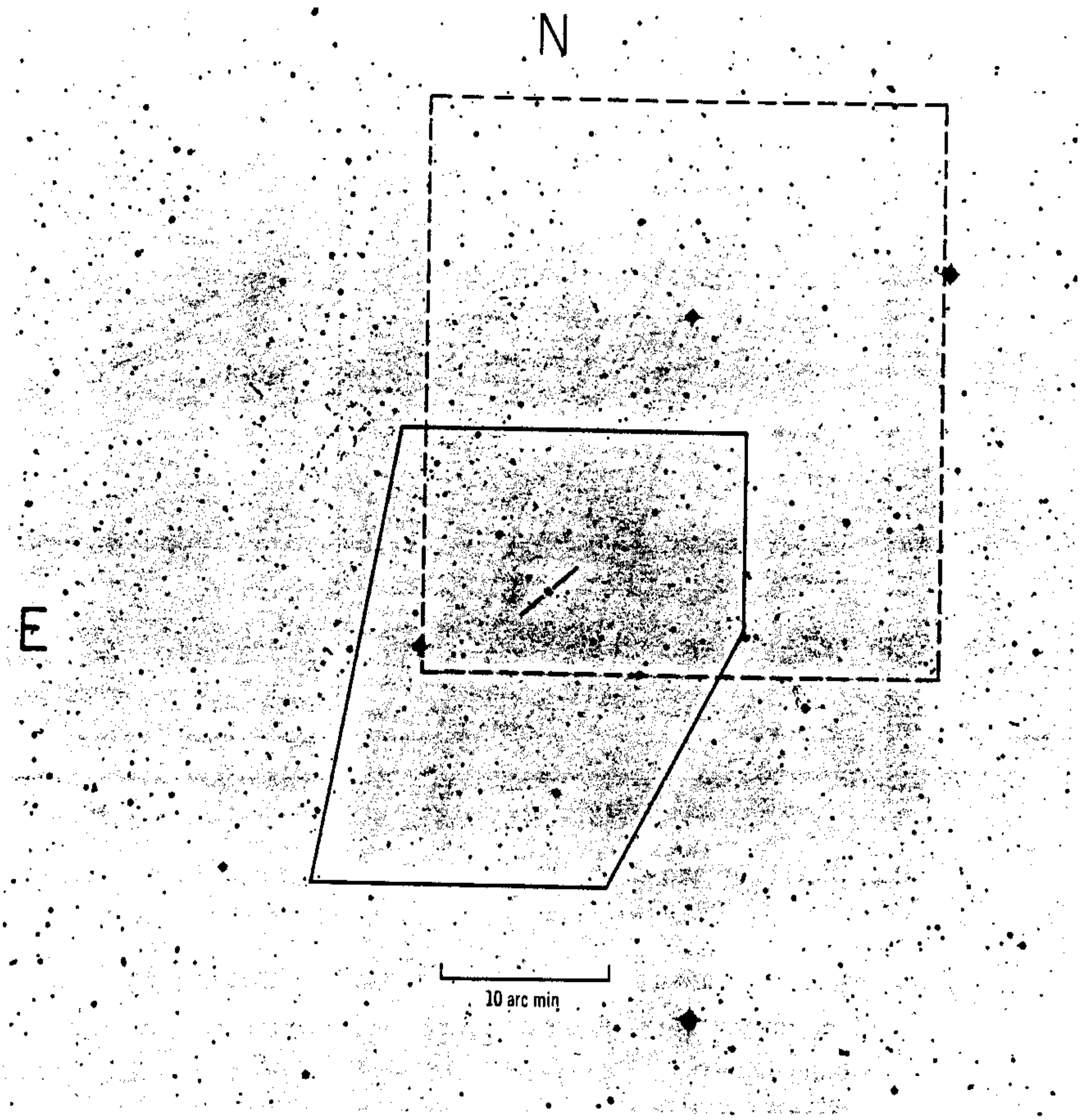


Figure 4-6.- Positional error box for the EUV source in Coma Berenices derived from the revolution 109 data (solid line). The broken line is the error box for the soft X-ray source observed from Small Astronomy Satellite-3 (ref. 4-15). The white dwarf HZ 43 is also marked in the center of the photograph. Enlargement is from the blue Sky Survey plate (copyright by the National Geographic Society - Palomar Observatory Sky Survey; reproduced by permission of the Hale Observatories).

ASTP-APOLLO
D-29597
7/14/75 - 7/24/75
format unknown, not on tape.

D-29597
C-19346

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$NOP **************** HEX DUMP OF X-422 ********************
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  DATA INPUT      1 2 2
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    FILE  1        RECORD     2      LENGTH    36     BYTES
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    (     40)  0E0DCC8E  400027FF  C2C10E09  000100C5  0016CECD  0CF24000  27FF0201  0D080001  00C50016  CE0DC156
    (     80)  400027FF  02010E08  C001CCC5  00160ECD  01BA4000  27FFC2C1  CE080001  00C50016  CE0D021E  400C27FF
    (    120)  0201CDC8  000100C5  C0160E0D  02824000  27FF0201  CDC80001  00C50016  0E0D02E6  400027FF  0201CE08
    (    160)  0001C0C5  00160E0D  C34A4000  27FF0201  0E0800C1  0CC50016  0E0D03AE  400027FF  02010D08  CCC1C0C5
    (    200)  0016CECE  002A4000  27FFC201  0D0800C1  00C50016  CECECC8E  400027FF  02010D09  000100C5  00160E0E
    (    240)  00F24000  27FF0201  CD08C001  00C50016  0E0E0156  4C0027FF  02010E08  000100C5  00160E0E  C1BA4000
    (    280)  27FFC2C1  0E080001  C0C50016  0E0E021E  400027FF  02C10DC8  000100C5  C0160E0E  02824000  27FF0201
    (    320)  0D08C0C1  00C50016  CECEC2E6  400027FF  02010EC8  CCC1C0C5  C0160E0E  034A4000  27FF0201  0EC80001
    (    360)  00C50016  0E0E03AE  400027FF  02010DC8  000100C5  CC16CECF  C02A4000  27FF0201  0D080001  0CC50016
    (    400)  0E0FC08E  400027FF  02010D08  000100C5  00160ECF  C0F24000  27FF0201  CD080001  00C50016  0ECFC156
    (    440)  400027FF  02010E08  C001C0C5  00160ECF  01BA4000  27FFC2C1  CE0800C1  00C50016  0E0F021E  4C0027FF
    (    480)  0201CDC8  000100C5  C016CE0F  02824000  27FF0201  CDC8CCC1  00C50016  CE0F02E6  400027FF  02C10E08
    (    520)  C0C100C5  00160E0F  C34A4000  27FF0201  CE090001
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    (     40)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (     80)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    120)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    160)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    200)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    240)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    280)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    320)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    360)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    400)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    440)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    480)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
    (    520)  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
  FILE     1        # OF DATA RECORDS    260       # SUCCESSFUL READS  260
          # PERMANENT READ ERRORS    C        # ZERO BYTE ERRORS  2        # SHORT RECORDS    0       # UNDEFINED ERRORS  0
            # OF RECORDS RETRIED    2        TOTAL # OF RETRIES  3

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197
1975

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 FILE   1      RECORD    2       LENGTH   36    BYTES
 (     0) 4679A38E  6C329B8D  39C33572  CF09E99A  16F05779  FC911008  0F0C3000  90411C5C  29D25C01
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 (    80) 400027FF  01010D09  00C100CD  00110A4B  0234400C  27FF0101  0D090001  C0CD0011  0A4B0298  40C027FF
 (   120) 0101CDC9  000100CD  C0110A4B  02FC4000  27FFC101  CDC90001  00CD0011  0A4BC360  400027FF  01010D09
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 (   200) C011CA4C  00A44000  27FF0101  0D090001  00CD0011  0A4CC1C8  400027FF  01010D09  000100CD  C011CA4C
 (   240) 016C4000  27FF0101  CDC90001  00CD0011  0A4C01D0  4CC027FF  01010DC9  000100CD  00110A4C  C2344000
 (   280) 27FFC1C1  0D090001  00CD0011  0A4C0298  400027FF  C1C10DC9  C00100CD  C0110A4C  02FC4000  27FF0101
 (   320) CD09C001  00CD0011  CA4CC360  400027FF  01010DCA  CCC100CD  C011CA4C  03C44000  27FF0101  0D090001
 (   360) 0CCDC011  0A4D0040  400027FF  01010D09  000100CD  CC11CA4D  C0A44000  27FF0101  CD090001  0CCDC011
 (   400) 0A4DC1C8  400027FF  C1C10E09  000100CD  00110A4D  C16C40C0  27FF0101  0D090001  00CD0011  CA4DC1D0
 (   440) 400027FF  01010D09  CCC1C0CD  00110A4D  02344000  27FFC1C1  CD09C001  00CD0011  0A4D0298  40C027FF
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 (    40) CA4EC1C8  400027FF  C1C10D09  000100CD  00110A4E  C16C4000  27FF0101  CD090001  00CD0011  0A4EC1D0
 (    80) 400027FF  01010D09  C00100CD  00110A4E  02344000  27FFC101  0D090001  00CD0011  0A4E0298  40CC27FF
 (   120) 0101CDC9  000100CD  C011CA4E  02FC4000  27FF01C1  CE09C0C1  00CD0011  0A4E0360  400027FF  01C10D09
 (   160) 0001C0CD  00110A4E  C3C44000  27FFC101  0D09C0C1  CCCDCC11  0A4F0040  400027FF  C1010D09  C0C100CD
 (   200) C011CA4F  00A44000  27FF0101  0D090001  00CD0011  CA4FC1C8  400027FF  C1010E09  C00100CD  C011CA4F
 (   240) 016C40CC  27FF0101  CD09C001  00CD0011  0A4F0234  40C027FF  01010D09  0001C0CD  00110A4F  02FCC000
 (   280) FFFFC1C1  0E090001  C0CDC011  0A4F0360  400027FF  C1C10DC9  000100CD  C0110A4F  C3C47F00  27FFFFFF
 (   320) FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
 (   360) FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
 (   400) FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
 (   440) FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
 (   480) FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
 (   520) FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF  FFFFFFFF
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         # OF RECORDS RETRIED    16      TOTAL # OF RETRIES  22

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